

## **REMARKS/ARGUMENTS**

### **I. Introduction**

Receipt of the Office Action mailed June 8, 2007 is acknowledged. The present response amends claim 1 to recite an Fe content of at most 0.3. Support for this amendment can be found throughout the specification and claims as originally filed, for example, on page 3, line 6. Claim 14 has also been cancelled without prejudice or disclaimer to be consistent with the amendment to claim 1. New claim 21 is the same as claim 1 but recites "consisting essentially of".

No new matter has been added. Entry of the amendment and favorable reconsideration are earnestly solicited.

### **II. Rejection of claims 1, 4-8, 10-13, and 15-20 under 35 U.S.C. 103(a) over JP 57-054244**

#### **A. The Rejection**

The Examiner rejects claims 1, 4-8, 10-13, and 15-20 under 35 U.S.C. 103(a) as allegedly being unpatentable over JP 57-054244A ("JP '244"). The Examiner contends that JP '244 teaches ranges that overlap or touch the boundary of the ranges claimed for Si, Mg, Cu, Ti, Zr, Fe, Mn, Zn, and Ni. The Examiner also contends that JP '244 teaches the addition of 0.1-0.2 Zr to increase the hot creep resistance of the alloy. Upon this premise, the Examiner submits that JP '244 creates a prima facie case of obviousness of the presently claimed invention. This rejection is respectfully traversed for at least the following reasons.

#### **B. Claims 1, 4-8, 10-13, and 15-20 are patentable over JP '244**

Claim 1, the only independent claim in the present application, is not obvious<sup>1</sup> under 35 U.S.C. 103(a) over JP '244 because of the difference in the scope and content of

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<sup>1</sup> Obviousness is determined using an analysis of the principles/factors for obviousness as set forth in *Graham v. John Deere*, 383 U.S. 1 (1966). See, *KSR International Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 82 USPQ 2d 1385 (2007). Under *Graham*, in order to determine obviousness as a legal matter, four factual inquiries must be made concerning: (1) the scope and content of the prior art, (2) the differences between

the JP '244 reference as well as the differences between the claimed invention and the JP '244 reference.

First, the JP '244 reference fails to disclose the ranges of Cu and Mg recited in claim 1. Specifically, the JP '244 reference discloses the broad ranges of 0.5 – 4.0 for Cu and 0.2 – 1.5 for Mg. In contrast, claim 1 recites a range of 0.3 – 1.5 for Cu and 0.15 – 0.6 for Mg. While these ranges may overlap, the physical properties demonstrated by these respective alloys are quite different.

As noted in paragraph 18 of the present specification, Mg is a normal alloying element for alloys used in cylinder heads. If the content of Mg is from about 0.15% - 0.6% (preferably 0.25-0.5 recited in claims 5, 17 and 19) and used in combination with about 0.3 – 1.5% Cu (preferably 0.4-0.7 recited in claims 4 and 19), the combination improves mechanical properties at 20°C and 250°C. When the Mg content is beyond 0.6%, as is the case in of the JP '244 reference, there is a certainty of reducing the ductility at ambient temperature because the limit of solubility of Mg is 0.6 and excess Mg remains out of solid solution in coarse intermetallics. In fact, in all examples of JP'244, the Cu content is between 1 and 3 % (fully outside range of claims 4 and 19) and the Mg content between 0.94 and 1.0% (fully outside all instantly claimed ranges). By using 0.3 to 1.5% of Cu with the other recited elements in the alloy of claim 1, mechanical strength is improved without affecting the corrosion resistance.

The inventors have also surprisingly observed that the mechanical strength and the creep resistance at 250°C are significantly improved if the contents of Cu and Mg % are within the limits of claim 1 while the condition  $0.3\text{Cu} + 0.18 < \text{Mg} < 0.6$  is maintained. In contrast, the JP '244 reference discloses a broad range of 0.5 – 4.0 for Cu<sup>2</sup> and 0.2-1.5 for Mg<sup>3</sup>. There is simply no motivation or reason why one of skill in the art would have utilized the claimed Mg and Cu ranges given the disclosure of JP '244.

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the claimed invention and the prior art, (3) the level of ordinary skill in the pertinent art and (4) secondary considerations on nonobviousness. *Id.* at 17. Such secondary considerations include such factors as commercial success, long-felt but unresolved need, unexpected results, the failure of others and copying. *Stratoflex, Inc. v. Aerogroup Corp.*, 713 F.2d 1530 (Fed. Cir. 1983); *Simmons Fastener Corp. v. Illinois Tool Works, Inc.*, 739 F.2d 1573 (Fed. Cir. 1984); *Gillette Co. v. S.C. Johnson & Sons Inc.*, 919 F.2d 720 (Fed. Cir. 1990).

<sup>2</sup> In other words, Cu can vary by up to 3.5 percentage points.

<sup>3</sup> A variation of up to 1.2 percentage points.

Lastly, the JP '244 reference teaches an iron (Fe) content of 0.4 – 1.0 which implies a secondary origin and an optional addition of Cr (0.1-0.3) which is usually added to reduce the deleterious effect of the large Al Fe Si intermetallics inherent to the high Fe content. In contrast, claim 1 recites an iron (Fe) content of <0.3 and does not recite the conscious addition of Cr. The presence of Fe and/or Cr at the levels disclosed in the JP '244 can increase strength but is notoriously known to be detrimental to ductility. Thus, it appears the main emphasis of the JP '244 reference is to produce an alloy having acceptable strength at high temperature while demonstrating low ductility. Conversely, Claim 1 recites an alloy that has been demonstrated to exhibit both unexpected increased creep resistance and ductility at high temperatures by Mr. Garat in his prior declaration.

Thus, Applicant respectfully submits that claim 1 and the claims depending therefrom are not obvious under 35 U.S.C. 103(a) over JP '244 because of the above articulated differences in the scope and content of the JP '244 reference as well as the differences between the claimed invention and the JP '244 reference. For all these reasons, it is respectfully submitted that the §103 rejection based on JP '244 is improper and should be withdrawn.

### **III. Rejection of claims 1-20 under 35 U.S.C. 103(a) over SU 348633**

#### **A. The Rejection**

The Examiner rejects claims 1-20 as allegedly being unpatentable under 35 U.S.C. 103(a) over SU 348633 ("SU '633"). The Examiner contends that SU '633 teaches ranges that overlap or touch the boundary of the ranges claimed for Si, Mg, Cu, Ti, Zr, Fe, Mn, Zn, and Ni. The Examiner submits that SU '633 creates a *prima facie* case of obviousness of the presently claimed invention because SU '633 teaches overlapping alloy ranges. This rejection is respectfully traversed for at least the following reasons.

#### **B. Claims 1-20 are patentable over SU '633**

Claim 1 is not obvious under 35 U.S.C. 103(a) over SU '633 because of the difference in the scope and content of the SU '633 reference as well as the differences

between the claimed invention and the SU '633 reference. The SU '633 reference discloses an aluminum alloy for heavy duty machinery body castings including, in part, 0.5-0.9 Mg. In contrast, claim 1 of the present application recites a Mg content of 0.15-0.6. As noted above, a Mg content higher than that recited in claim 1 certainly fails to demonstrate sufficient ductility for diesel cylinder head applications. Furthermore, the SU '633 reference discloses an aluminum alloy for heavy duty machinery body castings consisting of B and Be, as well as 0.1 – 0.2 mischmetal, each of which are not required by claim 1 and are specifically excluded in claim 21.

Lastly, the SU '633 reference also does not render claim 1 obvious under 35 U.S.C. §103 due to the fact the SU '633 reference describes an attempt to develop heavy duty machinery castings utilizing aluminum alloys requiring the simultaneous addition of Ti, Zr and V.<sup>4</sup> In contrast, the alloy recited in claim 1 achieves surprising and unexpected improvements in hot creep resistance over the base AlSiCuMg type alloy while retaining high ductility both at room and at elevated temperatures without the addition of Vanadium (see paragraphs 9-11 of the Garat Declaration submitted on April 6, 2007). As further explained in the declaration of Mr. Garat, it is both difficult and unexpected to achieve satisfactory creep resistance at hot temperatures without harming ductility for the alloys of claim 1. Thus, in light of the differences in scope and content articulated above, the SU '633 reference does not render claim 1 obvious. Furthermore, the SU '633 reference does not render claim 1 obvious because the SU '633 reference and cast part of claim 1 each employ entirely different alloys to achieve improved properties in entirely different components (i.e., body castings versus cylinder heads).

For all these reasons, it is respectfully submitted that the §103 rejection based on the SU '633 reference is improper and should be withdrawn.

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<sup>4</sup> The abstract provided appears to contain a typographic error for the maximum of Vanadium (0.0), however, the Russian text discloses a mandatory content of 0.1 – 0.3 in columns 2 and 4.

**IV. Rejection of claims 1-20 under 35 U.S.C. 103(a) over Dulin (U.S. Patent No. 2,821,495)**

**A. The Rejection**

The Examiner rejects claims 1-20 as allegedly being unpatentable under 35 U.S.C. 103(a) over Dulin (U.S. Patent No. 2,821,495). The Examiner contends that Dulin teaches ranges that overlap or touch the boundary of the ranges claimed for Si, Mg, Cu, Ti, Zr, Fe, Mn, Zn, and Ni. The Examiner submits that Dulin creates a prima facie case of obviousness of the presently claimed invention because Dulin teaches overlapping alloy ranges. This rejection is respectfully traversed for at least the following reasons.

**B. Claims 1-20 are patentable over Dulin**

The Dulin reference does not render claim 1 obvious because the Dulin reference attempts to offer up a solution to an entirely different problem from that contemplated by the present application. In short, the Dulin reference discloses methods of treating castings before brazing. The examples in the Dulin reference disclose a part cast with an AlSi7Mg alloy (AA356) brazed with another cast part and as well as a wrought product. Thus, the field of the Dulin reference is structural components such as parts of an automotive body or chassis, and certainly not engine parts such as a cylinder heads or engine blocks. In fact, in 1958 the problem of improving the hot creep resistance for highly stressed automotive cylinder heads in itself did not even exist. See claim 13 which is specifically directed to such parts. There is simply no indication by Dulin to utilize an alloy for the parts recited claim 13. As such, the problem addressed in the Dulin reference is not reasonably pertinent to the particular problem with which the present inventors were concerned. Furthermore, one of ordinary skill in the art at the time of the present invention would not have even considered the Dulin reference and even if so, would not have found the solution to the present problem within the reference or combined the teachings of the Dulin reference with another reference to produce the presently claimed alloys. For at least this reason, the Dulin reference does not render claim 1 obvious under 103(a).

Furthermore, under the *Graham* analysis, another key difference exists between the Dulin reference and the alloys of claim 1. That is, the Dulin reference fails to teach or even suggest the selection of Zr alone coupled with Cu and Mg to produce a cast part with high creep resistance as recited in claim 1. Instead, the Dulin reference states:

“[i]t may also be advantageous to include between 0.01 and 1% of one or more of the well known grain refining and hardening elements of the group composed of boron, titanium, chromium, manganese, zirconium, beryllium and nickel.”

Thus, the Dulin reference does not even suggest the presence of Zr, much less the combination of elements for the alloys recited in claim 1. This rejection is therefore improper and should be withdrawn.

A comparative table appears on the following page (page 11), illustrating the key differences in contents between the claimed invention and the three references cited by the Examiner. The differences appear in bold numbering and the amended range for Fe is noted by an underline.

# COMPARATIVE TABLE

	Claimed	JP'244	US Dulin	SU'33
Si	5 - 11	8.5 - 11.5	5 - 10	6 - 8
Fe	< 0.3	0.4 - 1.0		
Mg	0.15 - 0.6	0.2 - 1.5	0.25 - 0.6	0.5 - 0.9
Cu	0.3 - 1.5	0.5 - 4.0	0.1 - 1.5	0.3 - 0.7
Ti	0.05 - 0.25	Opt. 0.05- 0.15	Opt. 0.01 -1.0	0.1 - 0.2
Zr	0.05 - 0.25	0.1 - 0.3	Opt. 0.01 -1.0	0.05 - 0.2
Mn	< 0.4 (pref. 0.1-0.3)		Opt. 0.01 -1.0	0.1 - 0.2
Zn	< 0.3			
Ni	< 0.4		Opt. 0.01-1. 0	
Cr		Opt. 0.1 - 0.3	Opt. 0.01 -1.0	
B		Opt. 0.005 - 0.02	Opt. 0.01 -1.0	0.01 - 0.05
Be			Opt. 0.01 -1.0	0.005-0.01
Misch.				0.1 - 0.2
Autres	< 0.1 each < 0.3 total			V : 0.1 - 0.3

## V. Conclusion

Applicant respectfully submits that none of the newly cited references render the claims of the present application obvious under the *Graham* analysis. Each of the references fail to disclose or even suggest the claimed invention. Furthermore, the alloys disclosed in the SU '633 and Dulin references are not even reasonably pertinent to the particular problem and solutions recited in the claims of the present application. For these reasons, Applicant respectfully submits that the outstanding rejections under 103(a) are improper and respectfully requests each of the rejections be withdrawn.

Any comments or questions concerning the application can be directed to the undersigned at the telephone number given below. It is also respectfully requested that the Examiner expeditiously notify Applicant's undersigned attorney as to the disposition of the remarks presented herein in accordance with M.P.E.P. § 714.13.

Please find enclosed a petition for an Extension of Time sufficient and authorization to charge the amount required to effect a timely response. Please charge any deficiency in fees or credit any overpayments to Deposit Account No. 09-0528 (Docket #: A242 1090.US).

Respectfully submitted,

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